

Appendix A: Fish population base data.

Stream	HUC Number	Area Electrofished (m ²)	Time Electrofished (sec)	Number of Salmonids	Number of Sculpin	Salmonid Density (fish/m ² /hr effort)	Sculpin Density (fish/m ² /hr effort)
Coeur d'Alene River	17010303 3529 - 4023	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
Latour Creek ¹	17010303 3535	783	4,237	25	169	0.0271	0.1834
Baldy Creek	17010303 7535	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
Larch Creek	17010303 7536	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
Fourth of July ¹ Creek	17010303 3534	400	850	5	59	0.0529	0.6247
Willow Creek	17010303 3531	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
Thompson Creek	17010303 3530	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
Wolf Lodge Creek ¹	17010303 3541	400 2,200	1,041 3,897	13 37	160 137	0.1124 0.0155	1.3833 0.0575
Marie Creek	17010303 7541	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
Cedar Creek ¹	17010303 3541	350	861	55	48	0.6570	0.5734
Fernan Creek ¹	17010303 3543	N.D. (150)	N.D. (801)	N.D. (6)	N.D. (0)	N.D. (0.1798)	N.D. (0.0000)
Cougar Creek ¹	17010303 3545	200	744	19	16	0.4597	0.3871
Kid Creek	17010303 3546	N.D.	N.D	N.D	N.D	N.D	N.D
North Fork Mica ¹ Creek-Mica Creek	17010303 3547	200	1,500	5	4	0.0600	0.0480
Lake Creek ²	17010303 3549	93.88*	N/A	2.61	N.D.	0.0279	N.D.

Note: 1 - data from DEQ beneficial use reconnaissance program 1993; 2 - data from Cd'A Tribe; * - calculated based on average number per 100feet (30.48m) and mean width of 10.1 feet (3.08m); () - data from segment above WQL segment; N.D - no data.

Appendix B: Sediment Model Assumptions and Documentation

Sediment Model Assumptions and Documentation

Background:

Sediment is the pollutant of concern on the majority of the water quality limited streams of the Panhandle Region. The form the sediment takes is most often governed by the lithology or terrane of the region. Two major terranes dominate in northern Idaho. These are the meta-sedimentary Belt Supergroup and granitics present either in the Kaniksu batholith or in smaller intrusions as the Round Top Pluton and the Gem Stocks. In some locations Columbia River Basalt formations are important, but these tend to be to the South and West primarily on the Coeur d'Alene Reservation. Granitics weather to sandy materials with a lesser amount of pebbles or larger particle sizes. Pebbles and larger particle sizes with significant amounts of sand remain in the higher gradient stream bedload. The Belt terranes produce both silt size particles and pebbles and larger particle sizes. Silt particles are transported to low gradient reaches, while the larger sizes comprise the majority of the higher gradient stream bedload. Basalts erodes to silt size and particles similar to the Belt terranes, but the large basalt particles are less resistant, weathering to smaller particles.

Any attempt to model the sediment output of watersheds will provide, relative rather than exact, sediment yields. The model documented here attempts to account for all significant sources of sediment separately. This approach is used to identify the primary sources of sediment in a watershed. This identification of primary sources will be useful as implementation plans designed to remedy these sources are developed. The approach has the added advantage of identifying to the state of the technology all of the sources. If additional investigation indicates sources quantified as minor are not, the model input can be altered to incorporate this new information.

Model Assumptions:

Land use and sediment delivery:

RUSLE is the correct model for pasture. RUSLE accounts for production and delivery of sediment. Sediment modeled by RUSLE is fine.

WATSED covers production and delivery of sediment from forested areas. Sediment modeled by WATSED is fine and course.

Sparse and heavy forest of all age classes including seedling-sapling should be given mid range of the WATSED coefficient for the geologies, while areas not fully stocked by Forest Practices Act standards are given the upper end of the range.

WATSED coefficients can be modified within the range observed to estimate highway corridor land use and the effects of repeated wild fires.

Double burned areas have eroded significantly to the stream channel but are not now eroding; a residual sediment load in the channels is possible from previous catastrophic burns.

Road sediment production and delivery:

Road erosion using the CWE approach should be limited to the 200 feet of road on either side of road crossings, not to total road mileage.

The use of the McGreer relationship between CWE score and road surface erosion is a valid estimate of road surface fines production and yield. In the case of Belt terrane, it is a conservative (overestimate) estimate.

CWE data collected for actual road fill failures and sediment delivery reflects the situation throughout the watershed. Since the great majority of road failures occur during episodic high discharge events with a 10 - 15-year return period, road failures reflect the actions of the last large event and must be divided by ten for an annualized estimate.

Fines and course loading can be estimated for stream reaches where roads encroach on the stream using estimated an erosion rate on defined model cross-section. Erosion resulting from encroachment occurs primarily during episodic high discharge events with a 10 - 15-year return period, road encroachment erosion must be divided by ten for an annualized estimate.

Failing road fill and eroding bank is composed of fines and course material. The proportions of fines and course material can be estimated from the soil series descriptions of the watershed.

Sediment Delivery:

100% delivery from forest lands estimated with WATSED coefficients

100% delivery from agricultural lands estimated with RUSLE

100% delivery from all road miles up to 200 feet from a stream crossing as estimated by the McGreer relationship.

Fines and course materials are delivered at the same rate from fill failures and from erosion resulting from road encroachment..

Model Approach:

The sediment model attempts to account for all sources of sediment by partitioning these sources into broad categories.

Land use is a primary broad category. It is treated separate from other characteristics as stream erosion and roads. Land use types are divided into agricultural, forest, urban and highways.

Agriculture may be subdivided into working farms and ranches and small ranchettes, which currently exist on subdivided agriculture land. Sediment yields from agricultural lands which receive any tillage, even on an infrequent basis are modeled with the Revised Universal Soil Loss Equation (RUSLE). Sediment yields were estimated from agricultural lands (rangeland, pasture and dry agriculture) using the Revised Universal Soil Loss Equation (RUSLE) (equation 1)(Hogan, 1998).

Equation 1: $A = (R)(K)(LS)(C)(D)$ tons per acre per year where:

- : A is the average annual soil loss from sheet and rill erosion
- : R is climate erosivity
- : K is the soil erodibility
- : LS is the slope length and steepness
- : C is the cover management and
- : D is the support practices.

RUSLE does not take into account bank erosion, gully erosion or scour. RUSLE applies to cropland, pasture, hayland or other land which has some vegetation improvement by tilling or seeding. Based on the soils, characteristics of the agriculture and the slope, sediment yields were developed for the agricultural lands of each watershed. RUSLE develops values which reflect the amount of sediment eroded and delivered to the active channel of the stream system annually.

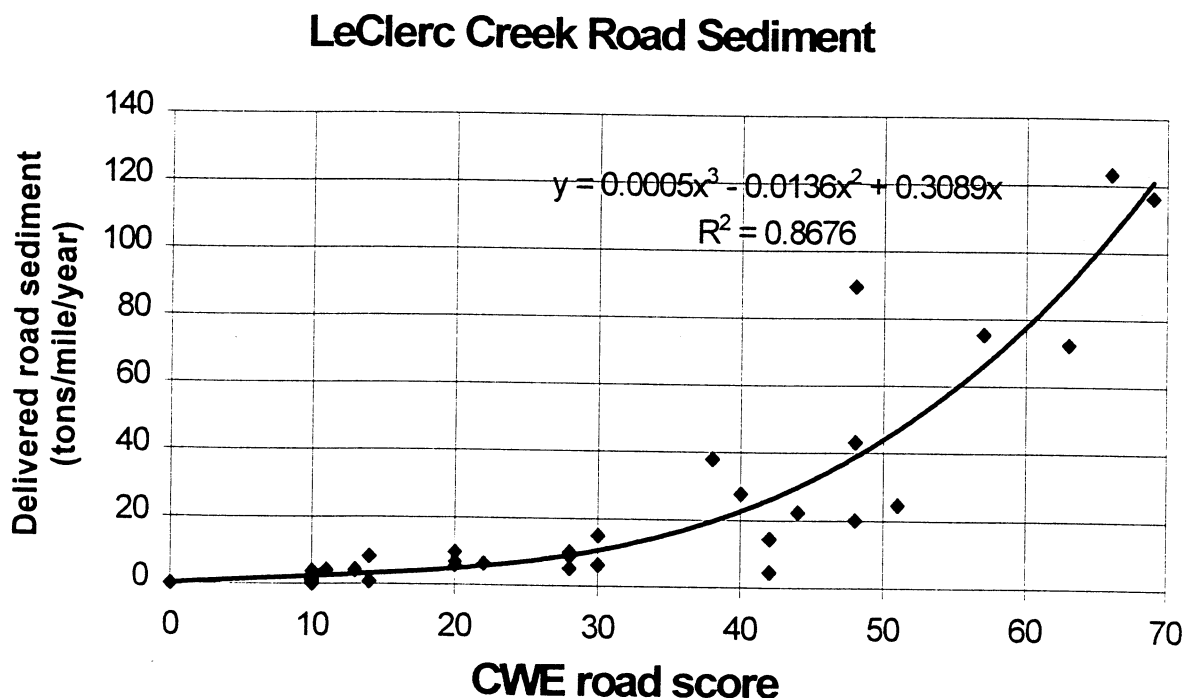
Forest lands and some land in highway rights of way are modeled using the mean export coefficients of the WATSED model for the particular geologic parent material (USFS, 1994). The values developed by WATSED are sediment eroded and delivered to the stream courses annually. Forest lands which are fully stocked with trees are treated with the median coefficient for sediment yields ascribed to that terrane. Lands not fully stocked by Idaho Forest Practices Act standards are assigned the highest coefficient of the range. Paved road rights of ways are assigned the lowest coefficient of the range. Areas which were burned by two large wild fires as delineated in IPFIRES are adjusted by a coefficient which is the difference between the highest value of the coefficient for the geologic type and the median.

All coefficients are expressed on tons per acre per year basis and are applied to the acreage of each land type developed from Geographical Information System (GIS) coverages. All land uses are displayed with estimated sediment delivery. Land use sediment delivery is totaled.

Roads are treated separately by the model. Forest haul roads are differentiated from county and private residential roads. County roads often have larger stream passage structures and are normally much wider and have gravel or pavement surfacing. Private residential roads are often limited in extent, but can have poor stream crossing structures. Sediment yields from county and private roads are modeled using a newer RUSLE model (Sandlund, 1999). Road relief, slope length, surfacing, soil material and width were the most critical factors. The sediment yield was applied only to the two hundred feet on either side of stream crossings. Failure of county and private road fills was assumed nonexistent, because such roads are often on more gentle terrain. As a consequence, road fill failures are rare.

Forest roads were modeled using data developed with the cumulative watershed effects (CWE) protocol. A watershed CWE score was used to estimate surface erosion from the road surface. Forest road sediment yield was estimated using a relationship between CWE score and the sediment yield per mile of road (Figure 1). The relationship was developed for roads on a Kaniksu granitic terrane in the LaClerc Creek watershed (McGreer, 1998). Its application to roads on Belt terrane conservatively estimates sediment yields from these systems. The watershed CWE score was used to develop a sediment tons per mile, which was multiplied by the estimated road mileage affecting the streams. In the case of roads, it was assumed that all sediment was delivered to the stream system. These are conservative estimates of actual delivery.

Figure 1: Sediment export of roads based on Cumulative Watershed Effects scores.



Forest road failure was estimated from actual CWE road fill failure and delivery data. These data were interpreted as primarily the result of large discharge events which occur on a 10 - 15-year return period (McClelland et. al, 1997). The estimates were annualized, by dividing the measured values by ten. The data are typically from a subset of the roads in a watershed. The sediment delivery value was scaled using a factor reflecting the watershed road mileage divided by the road mileage assessed. The sediments delivered through this mechanism contain both fine (material including and smaller than pebbles) and course material (pebbles and larger sizes). The percentages of fine and course particles were estimated using the described characteristics of the soils series found in the watershed. The weighted average of the fines and course composition of the B and C soil horizons to a depth of 36 inches was developed using the soils GIS coverage STATSGO, which contains the soils composition data provided by Soils Survey documents. The B and C horizons' composition was used because these are the strata from which forest roads are normally constructed. Based on the developed soil composition percentage and the estimated probable yield, the tons of fine and course material delivered to the streams by fill failure was calculated. This approach assumes equal delivery of fine and course materials.

Roads cause stream sedimentation by an additional mechanism. The presence of roads in the floodplain of a stream most often interferes with the streams' natural tendency to seek a steady state gradient. During high discharge periods, the constrained stream often erodes at the road bed, or if the bed is armored, erodes at the opposite bank or its bed. The erosion resulting from a road imposed gradient change results in stream sedimentation. The model assumes the roads causing gradient effects to be those within fifty (50) feet of the stream. The model then assumes one-quarter inch erosion per lineal foot of bank and bed up to three feet in height. The erosion is from the soils types in the basin with the weighted percentages of fine and course material. A bulk soil density of 2.6 g/cc is used to convert soil volume into weights in tons. The tons of fine and course material are totaled for all road segments within 50 lineal feet of the stream. The bulk of this erosion is assumed to occur during large discharge events which occur on a 10 - 15-year return period (McClelland et. al, 1997). The estimates were annualized, by dividing the measured values by ten.

The model does not consider sediment routing. The model does not attempt to estimate the erosion to stream beds and banks resulting from localized sediment deposition in the stream bed. The model does not attempt to measure the effects of additional water capture at road crossings. It is assumed, that on the balance, the additional stream power created by additional water capture over a shorter period would increase net export of sediment, even though some erosion would be caused by this watershed affect.

Where estimates of bank recession have been made along Rosgen C channels, these values are added into the watershed sediment load. The fine and course material fractions of the bank material are used to estimate fine and course material delivery.

Model Operation:

The model is a simple Excel spreadsheet model composed of four spreadsheets. Key data as acreage and percentages are entered into sheets one and two of the model. County and private road data are supplied in sheet four. The total estimated sediment from the varied sources is calculated in spreadsheet three.

Assessment of Model's Conservative Estimate:

Several conservative assumptions are made in the model construction, which cause its development of conservatively high estimations of sedimentation of the streams modeled. These assumptions are listed in the following paragraphs and a numerical assessment of the magnitude of the conservatism is assigned.

The model uses RUSLE and WATSED to develop land use sediment delivery estimates. The output values are treated as delivery to the stream. RUSLE does assume delivery if the slope assessed is immediately up gradient from the stream system. This is not the case on the majority of the agricultural land assessed. Estimates made in the Lake Creek Sediment Study indicate that at most 25% of the erosion modeled was delivered as sediment to the stream (Bauer, Golden and Pettit, 1998). A similar local estimate has not been made with WATSED, but it is likely this estimate would be 25% as well. The land use model component is 75% conservative.

The roads crossing component of the model assumes 100% delivery of fine sediment from the 200 feet on either side of a stream crossing. It is more like that some fine sediment remains in ditches. A reasonable level of delivery is 80%. The model is likely 20% conservative in this component. On Belt terrane, use of the McGreer model is conservative. Since the WATSED coefficient for Kaniksu granitic is 167% of the coefficient for Belt terrane, this factor is estimated to be 67% conservative.

Road encroachment is defined as 50 feet from the stream, primarily because this is near the resolution of commonly used mapping techniques. Roads fifty feet from streams but on side hills would not affect the stream gradient. The model is likely incorrect on encroachment 20% of the time and is conservative by this factor.

Fill failure data is developed from the actual CWE field assessments. The CWE assessment does not assess all the roads in the watershed. The failure rate data is scaled up by the factor of the roads assessed divided into the actual watershed road mileage. The roads assessed are typically those remote from the stream system, which are very unlikely to deliver sediment to the stream. The percentage of watershed roads assessed varies, but it is commonly 60% or less of the watershed roads. The model is 40% conservative in this component.

Table 1 summarizes the conservative assumptions and assesses its numerical level of over-estimation.

Model Diagram:

WATERSHED MODEL DIAGRAM

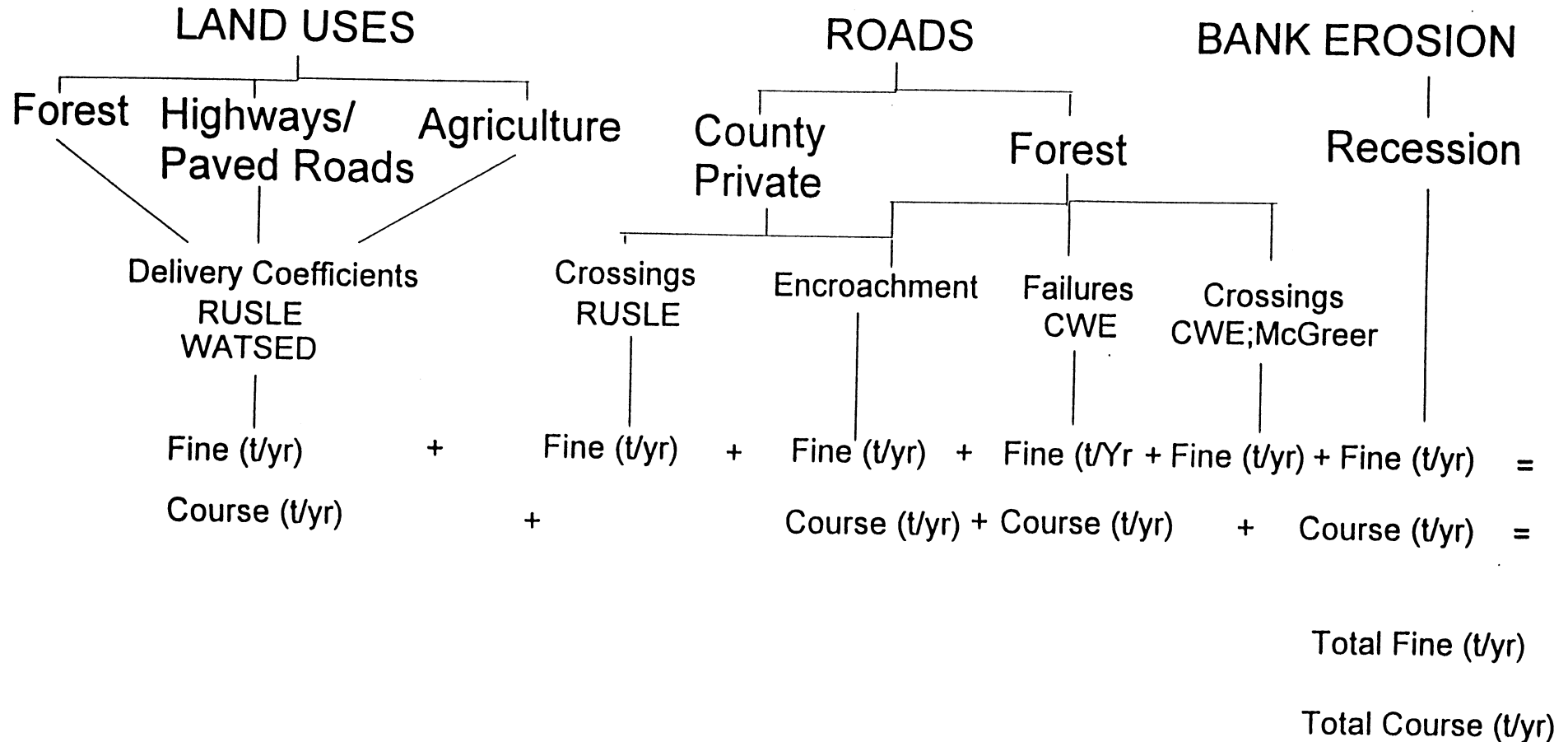


Table 1: Estimation of the conservative estimate of stream sedimentation provided by the model.

Model Factor	Kaniksu Granitic	Belt Supergroup
100% RUSLE and WATSED delivery	75%	75%
Crossing delivery	29%	20%
McGreer Model	0%	67%
Road encroachment at 50 feet	20%	20%
Road Failure	40%	40%
Total Assessment of Over-estimate	164%	231%

The model provides an over estimate by factors of 1.6 and 2.3 for the Kaniksu and Belt terranes, respectively. This over estimation is a built in margin of safety of 167% for Cougar and Mica Creeks and 231% for Wolf Lodge and Latour Creeks.

References cited:

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Soil Fines and Stone or Cobble Content Based on Weighted Average of Soil Groups Present

Watershed	Fines (%)	Stone (%)
Wolf Lodge	50	50
Cedar	50	50
Cougar	90	10
Kidd	70	30
Mica	70	30
Latour	40	60
Fourth of July	60	40
Willow	60	40
Thompson	60	40

Appendix C: Sediment Model Data Spreadsheets

Landuse

Wolf Lodge Creek Sediment Budget

Wolf Lodge Watershed Land Use

Sub-watershed	Cedar Ck	Marie Ck	Wolf Lodge Ck.
Pasture (ac)	77	23	923
Forest Land (ac)	11128	11537	15717
Unstocked forest (ac)	26.1	73.6	47.8
Highway (ac)	358	0	85
Double Fires (ac)	0	0	0

Wolf Lodge Watershed Roads

Forest roads (mi)	92.2	90.1	107.1
Ave. road density (mi/sq mi)	5.7	5	4.1
Forest road crossing freq. (#/mi)	0.2	0.1	0.4
Forest road crossing number	20	12	46
County & private road crossing number	3	0	4
CWE score	18.9	18.9	18.9
Unpaved county and private roads (mi)	5.2	0.8	5
Paved county roads (mi)	0	0	4.6
Yielding Forest roads (mi)	1.5	0.9	3.5
Yielding county and private roads (mi)	0.2	0.0	0.5
Forest road encroaching (mi)	6.3	2.5	6.3
County Road encroaching (mi)	0	0	0

Sed Yield

Wolf Lodge Creek Sediment Yield and Export Budget from Land Use Types

Watershed	Cedar Ck	Marie Ck	olf Lodge Ck.	Yield Coeff. (tons/ac/yr)
Pasture (tons/yr)	2.3	0.7	27.7	0.03
Conifer Forest (tons/yr)(fine)	128.0	132.7	180.7	0.023
(course)	128.0	132.7	180.7	
Unstoched Forest (tons/yr)(fine)	0.4	1.0	0.6	0.027
(course)	0.4	1.0	0.6	
Highway (tons/yr)(fine)	3.4	0.0	0.8	0.019
(course)	3.4	0.0	0.8	
Double Fires (tons/yr)(fine)	0.0	0.0	0.0	0.004
(course)	0.0	0.0	0.0	
Bank erosion (tons/yr)(fine)	0.0	0.0	16.5	33 tons/year (NRCS)
(course)	0.0	0.0	16.5	
Total Yield (tons/yr)(fine)	134.0	134.4	226.4	
(course)	131.7	133.7	198.7	

County, Forest and Private Road Sediment Yield

Watershed	Cedar Ck	Marie Ck	olf Lodge Ck	Yield Coeff. (tons/mi/yr)
Forest Roads				
Surface fine sediment (tons/yr)	13.6	8.2	31.4	9
Road failure fines (tons/yr)*	0.7	0.0	0.1	* Uses mass failure and delivery rates developed from CWE protocol pro-rated for road mi Soil Percent Fines/Cobble^ 0.243243
Road failure course (tons/yr)*	0.7	0.0	0.0	
Encroachment fines (tons/yr)#	16.9	6.7	16.9	0.5
Encroachment course (tons/yr)#	16.9	6.7	16.9	0.5
County and Private Roads				^ from weighted avearge of fines and stones in soils groups
Surface fine sediment (tons/yr)	16.6	0.0	13.6	
Road failure fines (tons/yr)	0.0	0.0	0.0	#Assume: one -quarter inch from three feet banks; density = 2.6 g/cc 0.020833 0.25"yr/12" 48591972 119*2*3*5280**28317cc/ft3*2.6 g/cc = g/yr 908000 454g/lb* 2000 lb/t 53.51539 t/yr/mile 276.1 204
Road failure course (tons/yr)	0.0	0.0	0.0	
Encroachment fines (tons/yr)	0.0	0.0	0.0	
Encroachment course (tons/yr)	0.0	0.0	0.0	

Totals

Wolf Lodge Watershed Sediment Export

Sub-watershed	Cedar Ck	Marie Ck	Wolf Lodge Ck.	Wolf Lodge Watershed	
Land use fines export (tons/yr)	134.0	134.4	226.4	494.8	
Land use course export (tons/yr)	131.7	133.7	198.7	464.1	
Road fines export (tons/yr)	47.9	14.9	61.9	124.6	
Road course export (tons/yr)	17.6	6.7	16.9	41.2	
Bank fines export (tons/yr)	0.0	0.0	16.5	16.5	
Bank course export (tons/yr)	0.0	0.0	16.5	16.5	
Total fines export tons/yr)	181.9	149.2	304.8	635.9	635.9
Total course export tons/yr)	149.3	140.4	232.1	521.8	521.8
				1157.6	
Natural Background	267	268	386		

Roads

Wolf Lodge Watershed County and Private Roads

Cedar Ck

name	county/pr	miles	width	grade (%)	% gravel	slope lgth	cut/fill	base mat.	oil textur	cut slope	live water	t/ac/yr	acres	tons/year
Alder Ck	county	5.2	30	3-4	5-10	500	50/50	native	silt loam	vered/sta	crosses	30	0.55	16.5
													total	16.5

Marie Ck

name	county/pr	miles	width	grade (%)	% gravel	slope lgth	cut/fill	base mat.	oil textur	cut slope	live water	t/ac/yr	acres	tons/year
Marie Ck	county	0.8	30	1	15-20	750	0/100	native	silt loam	N.A.	20-100'	5	0	0
													total	0

Wolf Lodge Ck.

name	county/pr	miles	width	grade (%)	% gravel	slope lgth	cut/fill	base mat.	oil textur	cut slope	live water	t/ac/yr	acres	tons/year
Gateway	private	0.9	20	0	5-10	500	0/100	native	silt loam	N.A.	crosses	2.7	0.28	0.8
Stella Ck	private	0.5	20	2	0	500	25/75	native	silt loam	vered/sta	none	16	0	0
Alder Ck.	county	0.8	30	3-4	5-10	500	50/50	native	silt loam	vered/sta	crosses	28	0.28	7.8
Toboggan	private	1.8	20	6	0	<500	50/50	native	velly silt lo	vered/uns	none	59	0	0
Meyer Hill	county	1	30	5-6	30	200	50/50	native	velly silt lo	vered/sta	crosses	18	0.28	5
												24.7	total	13.6

Wolf Lodge Ck. Road Paved

Cougar, Kidd and Mica Creeks Sediment Budgets
Watershed Land Use

Sub-watershed	Cougar	Kidd	Mica
Pasture (ac)	2609	1772	2606
Forest Land (ac)	7854	1887	12209
Unstocked forest (ac)	189	78	64
Highway (ac)	59.4	38	61.8
Double Fires (ac)	0	0	0

Road Data

Watershed	Cougar Ck	Kidd Ck	Mica Ck
Forest roads (mi)	50	18	40
Ave. road density (mi/sq mi)	3	3.1	1.7
Forest road crossing freq. (#/mi)	1.6	0.8	0.9
Forest road crossing number	66	10	47
County & private unpaved road crossing presumed CWE score	0	1	2
Unpaved county and private roads (mi)	12.8	2.4	1.2
Paved county roads (mi)			
Yielding Forest roads (mi)	5	0.8	3.6
Yielding county and private roads (mi)	0	0.1	0.2
Forest road encroaching (mi)	1.9	0.3	1.6
County Road encroaching (mi)	0	0	0

Sed Yield

Cougar, Kidd and Mica Creeks Sediment Yield and Export Budget from Land Use Types

Watershed	Cougar Ck	Kidd Ck	Mica Ck	Yield Coeff. (tons/ac/yr)		
				Cougar Ck	Kidd Ck	Mica Ck
Pasture (tons/yr)(fine)	78.3	88.6	130.3	0.03	0.05	0.05
Conifer Forest (tons/yr)(fine)	268.6	50.2	324.8	0.038		
(course)	29.8	21.5	139.2			
Unstoched Forest (tons/yr)(fine)	9.4	3.0	2.5	0.055		
(course)	1.0	1.3	1.1			
Highway (tons/yr)(fine)	1.8	0.9	1.5	0.034		
(course)	0.2	0.4	0.6			
Double Fires (tons/yr)(fine)	0.0	0.0	0.0	0.017		174.4
(course)	0.0	0.0	0.0			
Total Yield (tons/yr)(fine)	389.1	165.9	600.0			
(course)						

County, Forest and Private Road Sediment Yield

Forest Roads

Watershed	Cougar Ck	Kidd Ck	Mica Ck
Surface fine sediment (tons/yr)	25.0	2.3	35.6
Road failure fines (tons/yr)*	38.4	0.0	2.3
Road failure cobble (tons/yr)*	4.3	0.0	1.0
Encroachment fines (tons/yr)#	9.2	1.1	6.0
Encroachment cobble (tons/yr)#	1.0	0.5	2.6

* Uses mass failure and delivery rates developed from CWE protocol pro-ratec

Yield Coeff. (tons/mi/yr)^

5	3	10
Soil Percent Fines		
0.9	0.7	0.7 Fines
0.1	0.3	0.3 Cobble

^ from weighted avearge of fines and stones in soils groups

County and private roads:

Surface fine sediment (tons/yr)	0.0	6.5	0.7
Road failure fines (tons/yr)*	0.0	0.0	0.0
Road failure cobble (tons/yr)*	0.0	0.0	0.0
Encroachment fines (tons/yr)#	0.0	0.0	0.0
Encroachment cobble (tons/yr)#	0.0	0.0	0.0

Assume: one -quarter inch from three feet banks; density = 2.6 g/cc
0.020833 0.25"yr/12"
48591972 119*2*3*5280*28317cc/ft3*2.6 g/cc = g/yr
908000 454g/lb* 2000 lb/t
53.51539 t/yr/mile

* Fill failure rated as zero because crossings are bridges or on flat grade.

Totals

Cougar, Kidd and Mica Creeks Watershed Sediment Export

Sub-watershed	Cougar Ck	Kidd Ck	Mica Ck
Land use fines export (tons/yr)	358.0	142.7	459.0
Land use course export (tons/yr)	31.1	23.2	140.9
Road fines export (tons/yr)	63.4	8.7	38.7
Road cobble export (tons/yr)	4.3	0.0	1.0
Bank fines export (tons/yr)	9.2	1.1	6.0
Bank cobble export (tons/yr)	1.0	0.5	2.6
Total fines export tons/yr	430.6	152.6	503.7
Total cobble export tons/yr	36.4	23.7	144.4
Natural Background	407.0	143.5	567.8

Roads

Cougar, Kidd and Mica Watersheds County and Private Roads

Cougar Ck

name	county/pr	miles	width	grade (%)	% gravel	slope lgth	cut/fill	base mat.	soil textu	cut slope	live water	t/ac/yr	acres	tons/year
Stand Elk	private	0.25	20	1	5-10	>500	0/100	basalt		covered/sta	none	5.4	0.61	3.2
Mdwbrook	county	0.75	30	1	75	500	0/100	native		covered/sta	none	0.8	2.72	2.2
Heine	county	1.3	30	2	50	>500	25/75	native		covered/sta	50'	5.5	4.72	26
Woodside	private	0.5	20	2	50	300	0/100	native		covered/sta	at bottom	1	1.21	1.2
No name	private	0.35	20	3	5	>500	50/50	native		uncovered/uns	none	17	0.85	14.4
Thompson	county	1.7	30	4-5	20-30	300-400	50/50	native		uncovered/uns	20-50'	14	6.18	86.5
Bunn	county	0.6	20	3-4	90	>500	50/50	native		covered/sta	<100'	0.1	1.45	0.1
Cougar Et	county	0.5	30	3-4	50	500	50/50	native		covered/sta	none	3	1.81	5.5
Clemetson	county	0.9	30	3-4	50	400	50/50	basalt		covered/sta	crosses	1.8	3.2	5.9
Stack	county	1.7	30	4-5	30	200	50/50	native		covered/sta	none	12	6.18	74.2
Cougar G.	county	1.8	30	4-5	10	400	50/50	native		covered/sta	50-100	0.1	6.54	0.6
Miller	county	1.5	30	4-5	20	500	50/50	native		uncovered/uns	none	32	5.45	174.5
Reynolds	private	0.9	20	5-6	15	400-500	50/50	native		uncovered/uns	none	41	2.18	89.45
												10.3		

Kidd Ck.

name	county/pr	miles	width	grade (%)	% gravel	slope lgth	cut/fill	base mat.	soil textu	cut slope	live water	t/ac/yr	acres	tons/year
Hull	county	0.9	30	2-3	20	>500	50/50	native		covered/sta	none	15	3.27	49.1
Weniger	county	0.6	30	5	10	>500	50/50	native		covered/sta	crosses	32	2.18	69.8
												23.5		

Mica Ck.

name	county/pr	miles	width	grade (%)	% gravel	slope lgth	cut/fill	base mat.	soil textu	cut slope	live water	t/ac/yr	acres	tons/year
Carnie	county	0.15	30	1	50	>500	0/100	basalt		covered /sta	adjacent	2.3	0.55	1.2
Sausser	private	0.75	20	1	70-80	>500	0/100	nat/basalt		covered/sta	crosses	0.7	1.81	1.3
Mica Sprs	private	0.3	20	6	90	100	50/50	nat/basalt		covered/sta	none	1	0.73	0.7
												1.3		

Land Use

Latour, Baldy and Larch Creeks Sediment Budgets Watershed Land Use

Sub-watershed	Latour Ck.	Baldy Ck.	Larch Ck.
Pasture (ac)	257	0	0
Forest Land (ac)	23181	5372	548
Unstocked forest (ac)	3855	145	0
Highway (ac)	0	0	0
Double Fires (ac)	0	0	0

Road Data

Forest roads (mi)	186.9	48.2	0.5
Ave. road density (mi/sq mi)	4.4	5.4	0.6
Road crossing freq.	0.5	1.1	0
Road crossing number	65	12	0
County and private unpaved road crossings	2	0	0
CWE score	13.3	13.3	13.3
Unpaved county and private roads (mi)	4.4	0	0
Paved county roads (mi)	0	0	0
Yielding Forest roads (mi)	4.9	0.9	0
Yielding County and Private Roads (mi)	0.2	0	0
Encroaching Forest Roads	6.3	0.4	0
Encroaching County and Private Roads (mi)	0.1	0	0

Sed Yield

Latour, Baldy and Larch Creeks Sediment Yield and Export Budget from Land Use Types

Watershed	Latour Ck	Baldy Ck	Larch Ck	Yield Coeff. (tons/ac/yr)
Pasture (tons/yr)	5.1	0.0	0.0	0.02
Conifer Forest (tons/yr)(fine)	213.3	49.4	5.0	0.023
(course)	319.9	74.1	7.6	
Unstoched Forest (tons/yr)(fine)	41.6	1.6	0.0	0.027
(course)	62.5	2.3	0.0	
Highway (tons/yr)	0.0	0.0	0.0	0.019
Double Fires (tons/yr)	0.0	0.0	0.0	0.004
Total Yield (tons/yr)(fine)	260.0	51.0	5.0	
Total Yield (tons/yr)(course)	382.3	76.5	7.6	

County, Forest and Private Road Sediment Yield

Watershed	Latour Ck	Baldy Ck	Larch Ck	Yield Coeff. (tons/mi/yr)
Forest road				
Surface fine sediment (tons/yr)	24.6	4.5	0.0	5
Road failure fines (tons/yr)*	15.5	0.0	0.0	
Road failure cobble (tons/yr)*	23.2	0.0	0.0	* Uses mass failure and delivery rates developed from CWE protocol pro-rated
Encroachment fines (tons/yr)#	13.5	0.9	0.0	
Encroachment cobble (tons/yr)#	20.2	1.3	0.0	Soil Percent Fines^
County and private roads				0.4 Fines
Surface fine sediment (tons/yr)	6.2	0.0	0.0	0.6 Cobble
Road failure fines (tons/yr)*	0.0	0.0	0.0	^ from weighted avearge of fines and stones in soils groups
Road failure cobble (tons/yr)*	0.0	0.0	0.0	
Encroachment fines (tons/yr)	0.2	0.0	0.0	# Assume: one -quarter inch from three feet banks; density = 2.6 g/cc
Encroachment cobble (tons/yr)	0.3	0.0	0.0	0.020833 0.25"yr/12"
Total fine yield (tons/yr)	60.0	5.4	0.0	48591972 119*2*3*5280*28317cc/ft3*2.6 g/cc = g/yr
Total cobble yield (tons/yr)	43.8	1.3	0.0	908000 454g/lb* 2000 lb/t
				53.51539 t/yr/mile

* Fill failure rated as zero because crossings are bridges or on flat grade.

Total Sed

Latour Watershed Sediment Export

Sub-watershed	Latour Ck	Baldy Ck	Larch Ck	Latour Creek Watershed
Land use fines export (tons/yr)	260.0	51.0	5.0	316.1
Land use coarse export (tons/yr)	382.3	76.5	7.6	466.4
Road fines export (tons/yr)	46.3	4.5	0.0	50.9
Road cobble export (tons/yr)	23.2	0.0	0.0	23.2
Bank fines export (tons/yr)	20.5	0.9	0.0	21.4
Bank cobble export (tons/yr)	13.7	1.3	0.0	15.0
Total fines export tons/yr	326.9	56.4	5.0	388.4
Total cobble export tons/yr	419.3	77.8	7.6	504.6
Natural Background (tons/yr)	627.7	126.9	12.6	

Roads

Latour Ck County and Private Roads

name	county/pr	miles	width	grade (%)	% gravel	slope lgth	cut/fill	base mat.	oil textur	cut slope	live water	t/ac/yr	acres	tons/year
Latour Ck	county	3.85	30	1	10	200	25/75	native	silt loam	vered/sta	00'; crosse	4.7	0.55	2.6
Dudley Ck	county	0.5	30	1-2	10	>500	20/80	native	silt loam	vered/sta	crosses	13	0.28	3.6
													Total	6.2

**Fourth of July, Willow and Thompson Creeks Sediment Budgets
Watershed Land Use**

Sub-watershed	4th of July	Willow	Thompson
Pasture (ac)	1,548	453	618
Forest Land (ac)	16,193	3,386	1,868
Unstocked forest (ac)	165	36	80
Highway (ac)	336	0	0
Double Fires (ac)	906	0	0

Road Data

Forest roads (mi)	77.6	22.5	21
Ave. road density (mi/sq mi)	2.8	3.7	5.4
Road crossing freq.	1.2	1.5	2.2
Road crossing number	76	16	23
County and private unpaved road crossings	1	0	0
CWE score	20.2	24.6	17.3
Unpaved county and private roads (mi)			
Paved county roads (mi)	-	-	-
Yielding Forest roads (mi)	5.8	1.2	1.7
Yielding County and Private Roads (mi)	0.08	-	-
Encroaching Forest Roads	0.4	0.9	1.3
Encroaching County and Private Roads (mi)	0	0	0

Sed Yield

Fourth of July, Willow and Thompson Creeks Sediment Yield and Export Budget from Land Use Types

Watershed	4th of July	Willow	Thompson	Yield Coeff. (tons/ac/yr)		
Pasture (tons/yr)(fine)	46.4	18.1	24.7	0.03	0.04	0.04
Conifer Forest (tons/yr)(fine)	223.5	46.7	25.8	0.023		
(course)	149.0	31.2	17.2			
Unstoched Forest (tons/yr)(fine)	2.7	0.6	1.3	0.027		
(course)	1.8	0.4	0.9			
Highway (tons/yr)(fine)	3.8	0.0	0.0	0.019		
(course)	2.6	0.0	0.0			
Double Fires (tons/yr)(fine)	2.2	0.0	0.0	0.004		
(course)	1.4	0.0	0.0			
Total Yield (tons/yr)(fine)	278.6	65.4	51.8			
Total Yield (tons/yr)(course)	154.8	31.5	18.0			

County, Forest and Private Road Sediment Yield

Watershed	4th of July	Willow	Thompson	Yield Coeff. (tons/mi/yr)		
Forest road				9	10	8
Surface fine sediment (tons/yr)	51.8	12.1	13.9			
Road failure fines (tons/yr)*	0.8	0.0	0.0	Soil Percent Fines from weighted avearge of fines and stones in soils group		
Road failure course (tons/yr)*	0.5	0.0	0.0			
Encroachment fines (tons/yr)#	1.3	2.9	4.2			
Encroachment course (tons/yr)#	0.9	1.9	2.8	0.6	0.6	0.6
County and private roads				0.4	0.4	0.4
				# Assume: one -quarter inch from three feet banks; density = 2.6 g/cc		
				0.020833	0.25	yr/12"
				48591972	119*2*3	5280*28317cc/ft3*2.6 g/cc = g/yr
				908000	454g/lb*	2000 lb/t
				53.51539	t/yr/mile	
Total fine yield (tons/yr)	57.7	15.0	18.1	* Uses mass failure and delivery rates developed from CWE protocol pro-ratec		
Total course yield (tons/yr)	1.5	1.9	2.8			

* Fill failure rated as zero because crossings are bridges or on flat grade.

Sed Totals

Fourth of July, Willow and Thompson Creeks Watershed Sediment Export

Sub-watershed	4th of July	Willow	Thompson
Land use fine export (tons/yr)	278.6	65.4	51.8
Land use course export (tons/yr)	154.8	31.5	18.0
Road fine export (tons/yr)	57.7	12.1	13.9
Road course export (tons/yr)	1.5	0.0	0.0
Bank fines export (tons/yr)	1.5	2.9	4.2
Bank course export (tons/yr)	1.0	1.9	2.8
Total fines export tons/yr)	337.9	80.4	69.9
Total course export tons/yr)	157.3	33.5	20.8
Natural Background	419.6	89.1	59.0